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ABSTRACT

Psychophysiological research into the effects of mass media, specifically the music of the masses, promises increased insight into the control the media exert on all their consumers. Attention and retention of mass media messages can be tested by measuring the receiver's electrodermal activity, pupil dilation, peripheral vasodilation, and heart rate. These measurements give some indication of the communicative effectiveness of a media message, but, in the case of mass music, attention and retention are low among its users despite the high popularity of the music. The cognitive processes that come into action in response to music do not display traditional patterns of inductive logic but rather can be called "subtractive induction" since attention and retention do not increase with the repetition of the stimuli. (CH)

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NEW DIRECTIONS IN MASS COMMUNICATIONS RESEARCH:

PHYSIOLOGICAL MEASUREMENT

BY

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To imply that there have been trends in physiological research in mass communications is to exaggerate the role of physiology in the concern of those who study and work with the mass media. At the same time, it is also true that the number of psychophysiological studies bearing upon matters also studied by scholars of the mass media is increasing.[1] In this paper the principal directions and potential of electrophysiological and eye camera studies will be reviewed. A new theoretical construct--subtractive induction--will be proposed to explain the close attachment of our population to mass communications.

BACKGROUND

The earliest physiological studies of mass media materials date back to the late twenties and thirties. These early studies used recordings and film as stimuli with respiration rate, heart rate or electrodermal activity as dependent variables.[2] On the whole, the early studies were concerned with the characteristics of physiological measurement rather than with the systematic mapping of effects these media may have occasioned. An illustration of this sort of study was one by R. C. Davis who repeatedly played a recording of Beethoven's "Missa Solemnis" for his subjects. He noted an increase in responsivity of his subjects with repetition.

In the last two decades, a different point of view has been apparent, as marketing and advertising researchers have seen the applicability of physiological measures to their work.[3] The

underlying assumption in this more recent work seems to be that there is a predisposing response in the central nervous system which is an essential constituent of persuasion. This predisposing response is seen as (1) tending to influence the receiver to engage or not in a desired behavior as a consequence of attending to the persuasive message and (2) evident in the autonomic system largely without the conscious awareness or control of the receiver.

Characteristic of this approach are two studies by Krugman.[4] Drawing upon the pupil response work of Hess, Krugman, through Marplan, Inc., tested advertising copy. In his studies the pupil was photographed by a motion picture camera as the subject was exposed to control and test stimuli. Relative pupil dilation was considered to represent a generalized favorable response to a stimulus. In a relatively recent report, Krugman claimed to have isolated a characteristic of the electroencephalogram which can discriminate media involvement.

The work of Mackworth and others has sustained an interest in movement of the eye from one point of focus to another across a pictorial stimulus such as a photograph, poster or print advertisement.[5]

Much of the use made of physiological measurement by mass media researchers--academic and commercial--has been in response to the availability of instrumentation rather than to a reasoned application of principles derived from research in physiology, neurophysiology, physiological psychology or anatomy. This is not surprising as the rites of passage into these latter disciplines and their literature are complex and (frequently) tedious. Nevertheless, progress in these fields has produced a series of notions of potential importance

to researchers of the mass media.

By far the best developed body of thought in this regard are the cognitive models based upon the "orienting response," a psychophysiological construct. This literature has been summarized elsewhere.[6] The orienting response (OR) is a development from the work of Pavlov and later Russian investigators in their efforts to explain the cognitive process. The OR is described by Ye. N. Sokolov as the "non-specific reaction resulting in the tuning of the (sensory system) when exposed to a new stimulus" and has been equated with attention.[7] Sokolov offers a "neuronal model" explanation for the role of the OR in cognition. When the neural signal corresponding to a new stimulus arrives at the cerebral cortex, it does not follow an established pathway as would the signal of a familiar stimulus. A message is sent from the cortex to the Reticular Activation System (RAS) in the mid-brain which, in turn, sensitizes the sensory apparatus of the body so that more neural signals corresponding to the new stimulus will arrive at the brain. When these signals have become plentiful enough a model of the stimulus becomes established in the cortex, and the orienting response is no longer activated. Physiologically speaking, the fact that a stimulus occasions an orienting response would attest to its information value.

The attention value of entertainment and information materials is a matter of much concern in the mass media. An advertiser, a producer, or an editor succeeds or fails with the attention given his message. An obvious exploitation of this line of psychophysiological research would be to compare, by measuring the orienting response, the likely reception of differing commercials or programs. That program which occasioned the larger and more frequent orienting responses would be that with the

greater attention value.

But such a strategy encounters complications. High levels of attention do not facilitate all communication ends. In fact, as Krenaman demonstrated over twenty years ago, retention and attention (Krenaman operationalized attention as self-reported interest) are not linearly related.[8] Low retention is related to both high and low levels of attention; highest retention occurs with medium levels of attention. The better persuasive message will be one with moderate attention values. In everyday language, the effective message is "well done," meaning that it conforms to expectations of language, characterization and manners; these aspects of the message will then not be novel and hence will not occasion the orienting response. Rather the orienting response will be activated by our appeals--the novel elements of such a conforming message.

What are the specific procedures for measuring the orienting response? The most common indices are electrodermal activity, pupil dilation, peripheral vasodilation and heart rate. Electrodermal activity refers to changes in the permeability of the skin under electrodes placed on the palm, fingers or soles of the feet (GSR, galvanic skin response, represents one of the family of electrodermal measures).[9] Pupil dilation can be recorded by a motion picture camera or by a vertical scanning television device which converts pupil diameter to a directly measured value recorded on a conventional analog chart.[10] Peripheral vasodilation refers to the extent to which the bed of capillaries just beneath the surface of the skin are filled with blood. The measure is taken by a photocell which receives the light reflected from the capillaries by a small bulb mounted adjacent to the photocell, both of which are held against a finger by an elastic

band.

SOCIALIZATION AND SOCIAL EFFECTS OF MEDIA

If a new stimulus activates the orienting response until a "neuronal model" is established, then the sum of the neuronal models in the cortex should comprise the cognitive map of the individual involved. If the neuronal models of a large number of individuals could be examined, the composite would represent those neuronal models held in common across the group--socialized responses to stimuli (contemporary community standards?). In a persuasive message, it would be desirable to depart as little as possible from social norms, as briefly mentioned earlier. That portion which does depart from norms should probably represent the persuasive element of the message.

But at this point physiological study of the mass media encounters a paradox--that the great majority of the population spend the bulk of their communication lives selecting and consuming messages of nearly no attention value as indexed by the orienting response. This fact sharply contrasts with the everyday notions of the central nervous system as that part of the body that is constantly involved in learning.

In the case of undergraduate students at the University of Kentucky average consumption of popular recorded music runs at about six hours per day, four and one half hours directly from recordings, about one and one half hours from radio. A given individual may play the very same recording over and over again as many as twenty times or more in uninterrupted succession before changing to another selection. One student reported that he was in the habit of waking each and every morning to a clock-activated recording of the "William Tell Overture."

Other students continue to report that they cannot study, even sleep, without their favorite music.

What is the physiological basis for this passive but addictive consumption of such large amounts of mass music? There are some facts about the central nervous processing of music which distinguish it from other communication. In the case of speech discrimination, signals are typically processed in a small area in that hemisphere of the brain opposite the dominant hand.[11] That is, if a person is right handed speech will be processed in the left hemisphere (the contralateral hemisphere). There is some evidence, however, that music discrimination is processed in the hemisphere of the cerebrum that corresponds to the dominant hand (the ipsilateral hemisphere).[12] This fact may in part account for the difficulty with which the lyrics of songs are recalled.

In a 1970 study at the University of Utah students listened to three popular recordings. One of the records (the Carpenters' "We've Only Just Begun") had been listed on the best seller lists for nine consecutive months previous to the time of the study. Some of the respondents reported that they had purchased as many as three copies of the recording as earlier copies wore out. Undergraduate subjects listened to three currently popular recordings, after which they were given copies of the lyrics of the songs from which one in every five words was missing. The subjects were then asked to fill in the missing words to complete the lyrics. In the case of the most popular recording referred to above students averaged only sixty percent correct responses at this task in spite of their reports of strong familiarity with and liking of this song. As might be predicted from the foregoing, when the orienting response to this music was measured, the magnitude of the

OR was roughly inversely proportional to popularity and familiarity.

To connect this finding to the earlier discussion of the process of internalizing and storing cognitions, when the first neural signal of a novel stimulus arrived at the cerebrum, there was no "neuronal model" corresponding to it. As successive and more detailed signals about the same stimulus arrived there were a larger number of stimulus-related messages for central processing. When the neuronal model became established, the model stood for or summarized all of these different yet related signals. This was a process of developing from a mass of signals a parsimonious summary suitable for flexible storage and retrieval; the process is comparable to inductive logic. The conclusion of an inductive logical sequence comes to stand for the aggregate of specific instances which have occasioned it. Further consideration of the specific instances can then be in terms of the summary statement alone.

But in the case of the popular music discussed above and in consumption of much of the mass media, such an inductive process does not seem to be invoked. Instead a positive value seems to be placed on maintaining a high volume throughput of familiar specific instances which never seem to lead to inductive ends. The repetition of such material which does not elicit the orienting response may provide an alternative to communication as usually conceived of and to other human interactions which produce stress or the compulsion to conclusion-drawing and to the required higher levels of attention. The redundant stimulus may thus relieve socially induced tensions and produce such self-reports as "relaxation, diversion and liking." The term, subtractive induction, may be useful to distinguish this contrary mode of human central processing. It is in sharp contrast to the process of building neuronal

models which might be characterized as inductive in nature. Subtractive induction results in depressed, or less stressful, lower levels of attention; the cognitive process summarized by the notion of the orienting response describes a process of higher levels of attention.

It is possible, if not likely, that there are other preferred stimuli (other than mass music) in the mass media which [redacted] provide the same subtractive induction benefits. Soap opera, other serial melodrama, highly stylized professional sports--all may base their appeals in this phenomenon. Subtractive induction may be a necessary feature of complex societies in transition, where socialization occurs through the competition of rival institutions, and where stress is endemic. In a broader context, religion, such cultural practices as chewing betel nut or chewing gum, and a wide range of folk activity may have from time to time provided other sources of stimuli for subtractive induction.

ENDNOTES

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6. James E. Fletcher, "Old Time GSR and a New Approach to the Analysis of Communication," Quarterly Journal of Speech, Vol. LIX, 1973, 52-60.

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9. See Robert Edelberg, "Electrical Properties of the Skin," in Clinton C. Brown (Ed.) Methods in Psychophysiology (Baltimore: Williams and Wilkins Co., 1967), pp. 1-53; David T. Lykken and Peter H. Venables, "Direct Measurement of Skin Conductance: A Proposal for Standardization," Psychophysiology, Vol. VIII, 1971, 656-672.

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11. Richard Wyatt and Bernard Tursky, "Skin Potential Levels in Right and Left Handed Males," Psychophysiology, Vol. VI, 1969, 136.

12. Doreen Kimura, "Left-Right Differences in the Perception of Melodies," Quarterly Journal of Experimental Psychology, Vol.XVI, 1964, 355-358; George McKee, Brian Humphrey and Dale McAdam, "Scaled Lateralization of

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